Section 2 Traditional Hawaiian Artifacts

Test excavations within the City Center AIS study area produced a total of 62 traditional Hawaiian artifacts. The traditional Hawaiian artifacts consisted of a range of artifact types and function, including: volcanic glass debitage, basalt debitage and possible adze fragments, fishing tools, a basalt game stone, a slingstone weapon, an eating implement, and dog tooth and boar tusk ornaments. The majority of the traditional Hawaiian artifacts consisted of volcanic glass debitage (71.42%) with the remaining artifacts consisting of basalt flakes (11.11%) and miscellaneous artifacts (15.87%) (see Table 1).

The majority of the traditional Hawaiian artifacts was concentrated within the West Kaka‘ako zone of the City Center AIS study area. Of the basalt flakes and miscellaneous artifact types (18 total), 50% (9) were found within this zone, while 55% of the volcanic glass debitage (25 out of 45) was found in this zone. The artifacts were almost all found within the culturally-enriched A-horizon and the associated features of SIHP # -7428 and # -5820. The remaining basalt flakes and miscellaneous artifacts (9 total) were scattered within Downtown Waterfront (7), Kewalo (1), and Kaka‘ako Makai (1) zones, within SIHP #s -7427, -7429, and -2918. The remaining volcanic glass fragments were distributed within West Kalihi (4), Downtown Waterfront (4), Kewalo (1), East Kaka‘ako (1), and Kaka‘ako Makai (10), with the latter (volcanic glass within Kaka‘ako Makai) associated with the A-horizon and features of SIHP # -2918.

The following discussion focuses on the lithic assemblage and miscellaneous artifacts identified during the City Center AIS study and examines their archaeological and cultural context. A discussion of the volcanic glass debitage, their context, and energy dispersive X-ray fluorescence (EDXRF) analysis follows in Sections 2.5.2 and 3.

2.1 Methodology

Traditional Hawaiian artifacts were identified, and forms and functions determined, using standard reference material as well as online research (e.g. Kirch 1985, Emory et al. 1959, Stokes 1906, Malo 1951). Analyzed artifacts were measured, weighed, and photographed and a master catalogue produced (see Table 1). Select volcanic glass fragments, basalt flakes and artifacts were additionally sent for EDXRF analysis (see Section 3).

2.2 Traditional Hawaiian Artifact Analysis for Downtown Waterfront Zone (Test Excavations 96 to 115)

A total of seven traditional Hawaiian artifacts (excluding volcanic glass) were collected within the Downtown Waterfront zone, consisting of a bone fishing net repair tool, a boar tusk ornament, one adze flake, and four basalt debitage fragments (Table 1). The artifacts were documented within a culturally-enriched natural sediment (Stratum II) within Test Excavations 96 and 100 (SIHP # -7427). The stratum consisted of reworked natural alluvial sediment, which also contained charcoal, shell midden and faunal bone.

Table 1. Traditional Hawaiian Artifacts Assemblage

Acc. #	SIHP #	Zone	Trench	Stratum	Feature	Depth (cmbs)	Length (cm)	Width (cm)	Thick. (cm)	Weight (g)	Material	Count	Function
010-H-1		West Kalihi	010	Ih	-	90-115	0.65	0.45	0.45	0.5	Volcanic glass	1	Debitage
014-H-1			014	II	-	180-207	1.1	0.7	0.2	0.1	Volcanic glass	1	Debitage
019-H-1			019	II	-	198-220	0.4	0.35	0.1	<0.1	Volcanic glass	1	Debitage
020A-H-1			020A	II	-	236-253	1.0	0.6	0.1	0.4	Volcanic glass	1	Debitage
096-H-1	-7427	Downtown Waterfront	096	II	16	134-164	0.2	0.2	0.1	0.1	Volcanic glass	4	Debitage
							0.5	0.45	0.15				
							0.45	0.4	0.15				
							0.45	0.4	0.2				
096-H-2	-7427					168	4.9	0.75	0.5	1.7	Bone	1	Net mender
096-H-3	-7427					170	8.1	1.4	2.0	11.4	Tusk	1	Ornament
100-H-1	-7427		100	II	16	137-178	1.0	0.6	0.1	0.1	Basalt	1	Adze flake
100-H-2	-7427						1.2	0.9	0.25	0.4	Basalt	1	Debitage
100-H-3							1.0	0.5	0.15	0.1	Basalt	1	Debitage
100-H-4							0.65	0.6	0.1	0.05	Basalt	1	Debitage
100-H-5							0.6	0.5	0.1	0.05	Basalt	1	Debitage
119A-H-1	-7428	West Kaka'ako	119A	II	-	96	5.4	3.6	3.2	66.6	Basalt	1	Slingstone
120-H-1	-7428		120	II	4	112-126	0.8	0.5	0.1	0.3	Volcanic glass	1	Debitage
120-H-2	-7428				5	110-118	1.8	1	0.85	1.5	Volcanic glass	1	Debitage
120-H-3	-7428				6	107-120	0.5	0.3	0.1	<0.1	Volcanic glass	1	Debitage
120-H-4	-7428						2.7	2.1	0.5	3.9	Basalt	1	Flake
120A-H-1	-7428		120A	II	-	110-118	0.6	0.5	0.1	0.1	Volcanic glass	1	Debitage
120A-H-2	-7428				12	128-132	0.9	0.8	0.3	0.1	Volcanic glass	1	Debitage
120B-H-1	-7428		120B	II	-	110-130	4	4.7	1.4	51.4	Basalt	1	Flake
120B-H-2	-7428					130-140	4.7	4.1	1.5	24.8	Basalt	1	Flake
120B-H-3	-7428					130-140	0.8	0.5	0.3	0.1	Volcanic glass	1	Debitage
123-H-1	-02963		123	III	-	180-192	0.65	0.5	0.25	0.1	Volcanic glass	1	Debitage
124-H-1	-02963		124	IIa	1	118-144	1.1	0.6	0.5	0.7	Volcanic glass	7	Debitage
							0.7	0.45	0.4				
							0.6	0.3	0.1				
							0.5	0.4	0.1				
							0.65	0.3	0.1				
							0.3	0.2	0.05				
							0.8	0.75	0.3				
124-H-2	-02963			IIb	8	144-162	0.6	0.5	0.15	0.1	Volcanic glass	1	Debitage

141-H-1	-5820	West Kaka’ako	141	III	-	70	8.0	8.5	6.0	483.2	Basalt	1	Stone sinker
142-H-1	-5820		142	II	5	44-52	6.6	6.2	3.8	180.5	Basalt	1	Game stone
142-H-2	-5820				6	56-64	0.7	0.6	0.1	0.5	Marine shell	1	Fishhook
146A-H-1	-5820		146A	II	12	75-90	0.9	0.7	0.2	0.2	Volcanic glass	2	Debitage
							0.6	0.3	0.2				
146A-H-2	-5820		146A	II	14	85-95	1.05	1	0.8	1.0	Volcanic glass	2	Debitage
							0.8	0.3	0.1				
150-H-1	-5820		150	II	18	75-105	8.0				Human bone	1	Tool
150-H-2	-5820						2.2	1.5	0.9	3.8	Basalt	1	Tool
150-H-3	-5820				20	90-130	0.4	0.4	0.2	0.1	Volcanic glass	1	Debitage
151-H-1	-5820		151	Id	22	53-75	1.1	0.7	0.55	0.4	Volcanic glass	2	Debitage
							0.7	0.3	0.1				
151-H-2	-5820				-	66	1.95	1.15	0.4	0.9	Volcanic glass	1	Flake
151-H-3	-5820			II	-	80-97	0.8	0.5	0.1	0.1	Volcanic glass	1	Debitage
151A-H-1			151A	Id	26	57-78	0.45	0.4	0.2	0.1	Volcanic glass	1	Debitage
167-H-1	-7429	Kewalo	167	II	-	140	3.6	1.15	0.7	2.6	Canine, *Canis lupus familiaris*, tooth	1	Ornament
177-H-1			177	IIa	-	90-105	0.35	0.1	0.1	0.1	Volcanic glass	1	Volcanic glass
189-H-1	-6636	East Kaka'ako	189	III	-	142-151	0.5	0.35	0.2	0.1	Volcanic glass	1	Debitage
226A-H-1	-2918	Kaka'ako Makai	226A	Ic-II	-	-	7.25	1.4	0.85	2.8	Bone, *Canis lupus familiaris*	1	Pick
226A-H-2	-2918			II	3	97-100	1.1	0.7	0.6	0.1	Volcanic glass	1	Debitage
226B-H-1	-2918		226B	II	-	73-76	0.8	0.55	0.35	0.1	Volcanic glass	1	Debitage
226B-H-2	-2918				8	76-90	0.7	0.65	0.15	0.1	Volcanic glass	1	Debitage
226B-H-3	-2918				5	80-90	0.8	0.7	0.2	0.1	Volcanic glass	1	Debitage
226B-H-4	-2918				6	82-93	1.1	0.6	0.5	1.1	Volcanic glass	3	Debitage
							1.1	0.8	0.45				
							0.8	0.5	0.3				
227A-H-1	-2918		227A	II	25	94-108	0.8	0.55	0.3	0.2	Volcanic glass	1	Debitage
227A-H-2	-2918				23	108-131	1.2	0.7	0.5	0.5	Volcanic glass	2	Debitage
							1	0.4	0.4				

2.2.1 Fishing Net Repair Tool

A fishing net repair tool (*kī‘o‘e*) carved from the long bone of a medium mammal was found at approximately 1.68 m below surface within a culturally-enriched natural sediment within Test Excavation 96 (Figure 1). The *kī‘o‘e* is broken in the handle portion, with the pointed end still intact, and shows visible use-wear striations around the circumference of the shaft as well as tool marks from manufacture in the shoulder near the point.

Net Fishing Practices and the Use and Manufacture of *Kī‘o‘e*

One of the most varied and extensive occupations in Hawai‘i, fishing required various tools and methods. Methods of fishing include catching by hand or groping (*hāhā*); spearing (*‘oi‘a*); noosing (primarily used to catch sharks); fish traps; fishhooks (*makau*); and nets (*‘upena*), the latter consisting of the most diversified and profitable method of catching fish. Implements used in net making included the mesh gauge (*haha kā‘upena*), netting needle (*hi‘a ‘upena*) and the net mender (*kī‘o‘e*) (Buck 1964:290; Krauss 1993:35).

Kī‘o‘e, such as the artifact found within T-096, were straight pieces of wood or bone, with the thicker handle cut down with a sharp shoulder at its junction with the thinner point end. Buck described a number of these held by the Bishop Museum:

> In the Museum series of 22, with the exception of one abnormally large specimen, the lengths range from 5 to 7 inches; the handle thicknesses from 0.25 to 0.3 inch; and the point lengths, from 1.5 to 2.4 inches. The point part at the handle junction is consistently 0.2 inch thick, trimming down to 0.15 or 0.1 inch at the end of the point. (Buck 1964:292-293)

The technique utilized in the usage of *kī‘o‘e* is described by Stokes (1906):

> To fill this style of needle, two half hitches were passed around the tapered end and a loop made around the fingers of the hand holding the tool, as shown [Figure 2]. For very fine nets a *niao*, piece of the midrib of a coconut leaf, was substituted for this form. (Stokes 1906:107-108).

After Contact, some shuttles were made with ivory and pine (Stokes 1906:109-110), indicating that this *kī‘o‘e* likely dates to the pre-Contact period.

Figure 1. Bone net mender tool (*kī‘o‘e*) found in T-096, Stratum II (Acc. # 096-H-2)

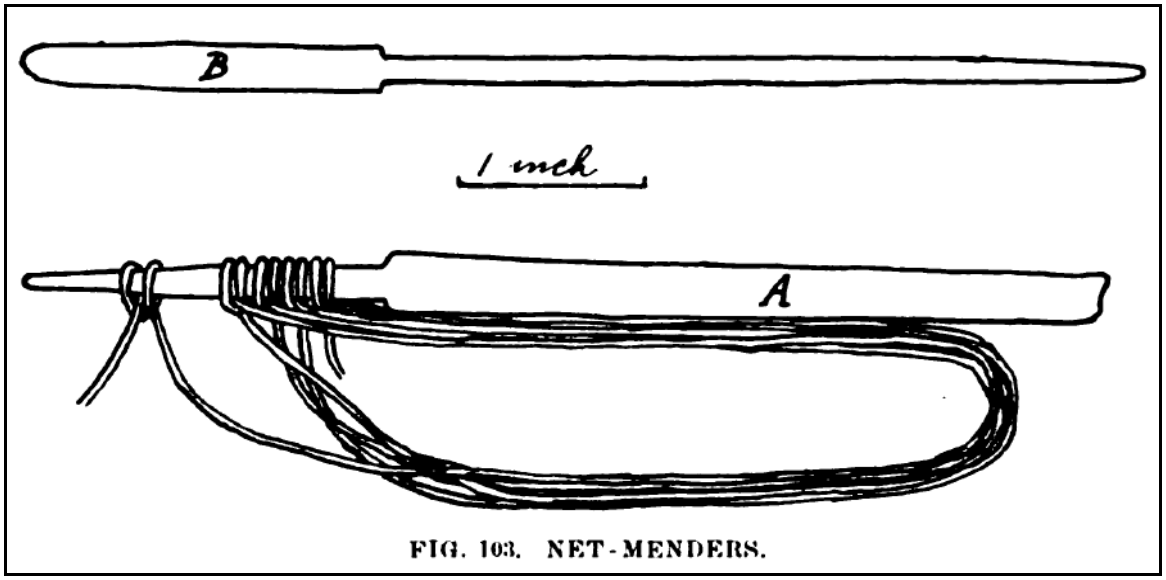


Figure 2. Depiction of a net mender with mending line (Stokes 1906:108)

2.2.2 Boar Tusk Ornament

A boar tusk ornament (*lei niho pua‘a*) was found at approximately 1.7 m below surface within a culturally-enriched natural sediment (Stratum II) within Test Excavation 96 (Feature 16). The tusk is drilled 0.5 cm from the proximal end, through both sides of the tusk (Figure 3).

Figure 3. Boar tusk pendant (*lei niho pua‘a*) found in T-096, Stratum II (Acc. # 096-H-3)

Boar Tusk Ornaments in Hawai‘i

Boar teeth were known to have been utilized in pre-Contact Hawai‘i for ornamentation, worn as a bracelet (*kupe‘e ho‘okalakala*) or a pendant necklace (*lei niho pua‘a*).

Bracelets of boar tusks (*kupe‘e ho‘okalakala*) were composed of multiple tusks strung together by an *olonā* cord (Figure 4). As described by Buck:

> “Bracelets of boar tusks (*kupe‘e ho‘okalakala*) were made of 19 to 24 tusks matched as to length and with the hollow roots ends in the same direction, The tusks are naturally curved and triangular in section with the base on the concave side. Two holes were drilled 1.5 to 1.75 inches apart from side to side of each tusk, and the tusks were arranged with the concave length outward. A long *olona* cord was threaded through the upper set of holes, looped downward, and threaded back through the lower set of holes.” (Buck 1965:546)

In contrast to the bracelet described above, the artifact collected from Test Excavation 96 has a single drilled hole at the proximal end, indicating that it was likely utilized as a *lei niho pua‘a.* While not as commonly identified as the *kupe‘e ho‘okalakala,* boar tusk pendants have been catalogued within various collections, such as the California Academy of Sciences Ostheimer Collection, which catalogued three *lei niho pua‘a*, one of which was as found within a shelter in Hanapepe Valley, Kaua‘i (http://researcharchive.calacademy.org/research/anthropology/collections/index.asp).

Figure 4. Photograph of *kupe‘e ho‘okalakala* (18th or 19th century) (www.britishmuseum.org)

2.2.3 Lithics

An adze flake and four basalt debitage fragments were found within the culturally-enriched natural sediment within Test Excavation 100 during the wet-screen processing of a bulk sample taken between 1.37-1.78 m below surface. Analysis of the adze flake, which consists of very fine-grained black basalt, indicated that it was chipped off either as the result of use or rejuvenation (retouching) of a finished adze, as a finished adze has polish on the dorsal surface. The additional four very small basalt artifacts appear to be lithic debitage; however, due to the small size of the fragments little more can be said regarding the type of implement being produced or retouched.

2.3 Traditional Hawaiian Artifact Analysis for West Kaka‘ako Zone (Test Excavations 116 to 161)

A total of nine traditional Hawaiian artifacts (excluding volcanic glass) was collected within the West Kaka‘ako zone, including: a basalt slingstone, three basalt flakes, a stone sinker, a basalt game stone, a shell fishhook, a basalt tool fragment, and a worked human bone tool (see Table 1). The artifacts were documented within two archaeological cultural resource areas, SIHP #s -7428 and -5820, both of which consisted of a culturally-enriched A-horizon and associated features.

2.3.1 Basalt Slingstone

A thermally-altered basalt slingstone (*‘alā o ka ma‘a*) was found within the A-horizon (Stratum II) of Test Excavation 119A at 0.96 m below surface (Figure 5). Although the slingstone was not found within a feature, radiocarbon dating of a charcoal sample collected adjacent to and at the same depth as the slingstone provided a 2-sigma calibrated date range of AD 1660-1890 (see discussion in Section 4). It is likely that the slingstone was deposited in this location during the same time period.

Interestingly, previous archaeology in the near vicinity (approximately 240 m to the southeast) of T-119A (Pfeffer et al. 1993) documented a burial of an adult male with 11 associated basalt slingstones (SIHP 50-80-14-04533-1) of much the same style.

The Use and Manufacture of Stone Slingstones in Hawaiian Warfare

Traditional Hawaiian warfare utilized a variety of stone, wood, cord, and shark teeth weapons, including: spears (*pololū*, *ihe*), daggers (*pāhoa*), clubs (*newa, pōhaku newa*), shark-teeth weapons (*leiomano*), tripping cords (*pīkoi*), strangulation cords (*ka‘ane*), throwing axes (*ko‘i*), and slings (*ma‘a*) (Paglinawan et al. 2006). Slingstones were highly lethal projectiles used for long-range combat, for maiming and killing opposing warriors, prior to closing ranks for hand-to-hand combat.

The nineteenth century Hawaiian historian David Malo mentioned the sling (*kā‘alā*) among the many arts of war that men should constantly practice:

> The ali‘i(s) beneath the ali‘i nui gathered people for themselves like the ali‘i nui. These people were taught the skills of warfare and every movement (kau) in the use of ihe and pololū [*spears*], lā‘au and pālau [*clubs*], ku‘ia [*sharp dagger*], kā‘ala [*sling*], kuielua (ku‘ialua) [*the art of* lua *fighting*] and ka pākīkō [use of a stone adze?]. (Malo1987:265)

William Ellis described a slingstone practice session during his travels around the islands:

> One of the exercises consisted in slinging stones at a mark. They threw their stones with great force and precision, and are supposed to have been able to strike a small stick at fifty yards’ distance, four times out of five. (Ellis 1984:149)

The slingstone weapon was comprised of two parts, a sling device and a stone projectile. The sling device was made from coconut fiber, plaited *hala* leaves, or *hau* bark (Paglinawan et al. 2006). The slingstone was fitted into the pocket of the sling:

> The sling was then laid over the shoulder and “gripped in the left hand behind the back”. After being stretched tight with both hands, the sling was let go from the left hand, swung around the head once with the right hand, and then released. The aim was to get the stone to travel as low to the ground as possible so that it would be hard to evade. (Paglinawan et al. 2006)

Slingstones could be selected water-rounded stones or shaped conical stones of basalt or other material (Kirch 1985; Buck 1964). While most specimens were made of basalt, limestone could also be used (Folk and Chiogioji 1990) (Figure 6). The spindle shape, or double conical form, of the slingstones was designed to prevent the stone from rolling out of the pocket of the sling (Stokes 1917) (Figure 7). The Bishop Museum collection of slingstones, collected from various parts of the Hawaiian Islands, was examined and measured by Buck:

> Of the 20 sling stones examined, the lengths range from 1.8 inches to 3.4 inches [4.57-8.63 cm], with an average of 2.2 inches [5.58 cm]; the middle diameters range from 1.45 inches to 2 inches [3.68-5.08 cm], with an average of 1.6 inches [4.06 cm]; and the weights range from 2.5 to 10 ounces [70.87-283.49 g], with an average of 4.4 ounces [124.73 g]. One specimen was practically round. (Buck 1964:462)

The basalt slingstone found within Test Excavation 119A fits within the average range of length and width for slingstones, although it was at the light end for the weight range.

Figure 5. Slingstone (*‘alā o ka ma‘a*) found in T-119A, Stratum II (Acc. # 119A-H-1)

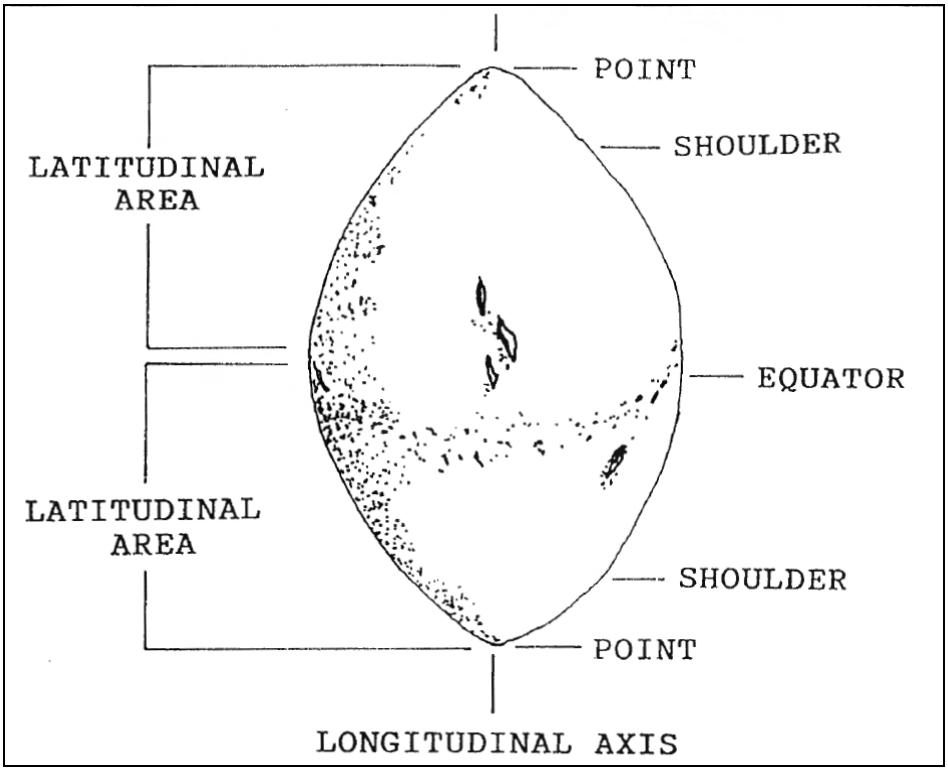


Figure 6. Parts of a slingstone (Folk and Chiogioji 1990:16)

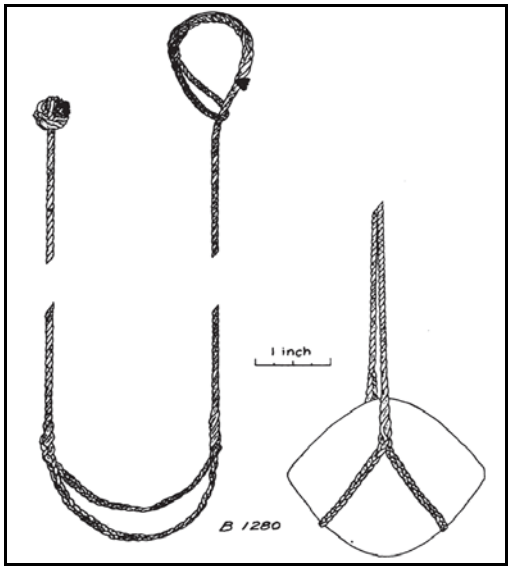


Figure 7. Model of a sling made of *olonā* fiber, with sling stone (Stokes 1917:47)

2.3.2 Lithics

Three basalt flakes were documented within West Kaka‘ako zone, all within SIHP # -7428. In Test Excavation 120, a single flake was documented within Feature 5 (Stratum II) between 1.07-1.20 m below surface. The flake showed a broken or shattered distal end (Figure 8). In Test Excavation 120B, two basalt flakes were documented within the culturally-enriched A-horizon (Stratum II) between 1.1-1.3 and 1.3-1.4 m below surface (Figure 9, Figure 10). No indication of use was visible.

Figure 8. Basalt flake found within T-120, Feature 5, Stratum II (Acc. # 120-H-4)

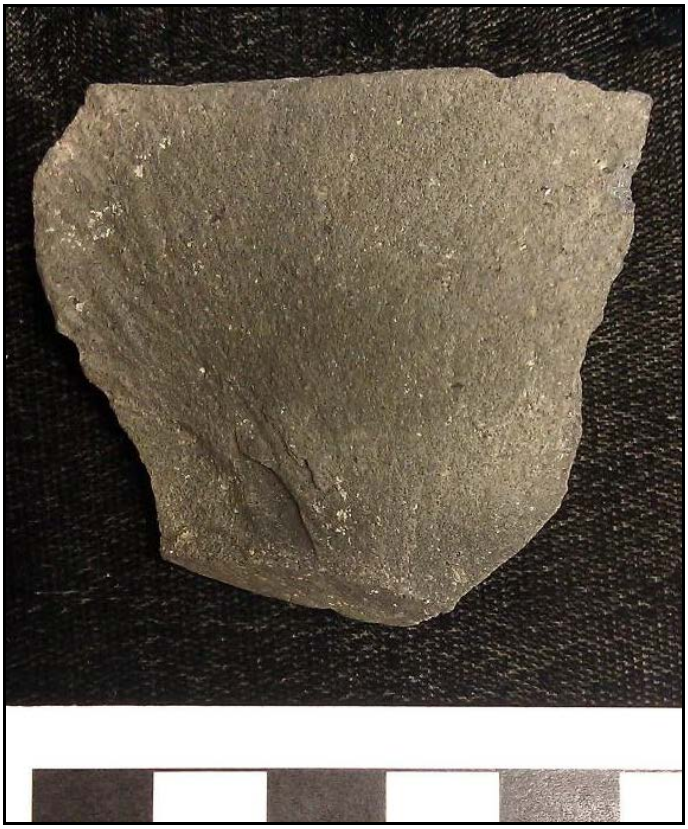


Figure 9. Basalt flake found within T-120B, Stratum II (Acc. # 120B-H-1)

Figure 10. Basalt flake found within T-120B, Stratum II (Acc. # 120B-H-2)

2.3.3 Stone Sinker

A vesicular basalt stone sinker was documented within Jaucas sand (Stratum III) in Test Excavation 141 at 0.7 m below surface (Figure 11). The stone is grooved along the center of its length, with the groove extending down the sides of the stone but not completely circling it. The stone was thermally-alteredsuggesting it may have been used within an *imu* (underground oven).

The size, weight, and grooved character of the stone indicate a stone sinker used in fishing ; however, it is not clear whether the stone was utilized as a *kilo* stone for near-shore fishing of squid (*he‘e*), as a sinker for line fishing in deeper water, or as a converted squid-lure sinker.

Stone Sinkers and Squid Lures

Stone sinkers of various shapes and sizes were used by fishermen in combination with nets, lures, lines and ground bait. According to Buck, “Hawaiian sinkers fall into four groups: grooved, perforated, bread-loaf, and plummet” (Buck 1964:342) (Figure 12). Most of the sinkers in the collection of the Bishop Museum are of the grooved type and made of vesicular basalt. Five of the grooved sinkers in the Bishop Museum collection “are converted squid-lure sinkers, with a continuous groove over the flat under surface” (Buck 1964:343). The documented stone sinker in Test Excavation 141 measured at the low end of weight for deep sea fishing sinkers (which ranges from 0.45 to 2 kg in the Bishop Museum collection).

Alternatively, the documented stone sinker shows very similar characteristics to a *kilo* lure for catching squid. The Hawaiians used three methods for fishing squid and octopus, depending on the depth of the water. These were spearing (shoreline), the *kilo* method (near-shore, from 6 to 10 fathoms), and the use of a cowrie-shell lure (deep-sea), which commonly used the “coffee-bean” shaped stone sinker (Buck 1964). Buck describes in detail a *kilo* lure specimen found in the collection of the Bishop Museum, and the lashing method used to attach the stone to the shaft:

> A specimen in the Museum collection (3791) has a wooden stem, a stone sinker, a bone hook, and no cowrie shell. It complies with Kamakau’s description of the stone lure except that it has no tail of ti leaves [Figure 13, Figure 14]. The stem is 5.3 inches long and 0.3 inch thick. The sinker is a circular, flat, water worn stone, 2.4 and 2.9 inches in cross diameters and 1.3 inches thick. One flat surface of the stone is laid against the stem toward the front end and tied to it with an *olona* thread. The thread is tied to the front end of the stem, passes back over the stone in the middle line, and passes around the stem at the back edge of the stone. The longitudinal turns backward and forward over the stone run diagonally to opposite sides of the stem. After a number of turns, the lashing is tightened by two longitudinal turns, which are made on the under surface of the stone to pass around the front and back ends of the lashing as they pass between the stone and the stem.
>
> The hook is an attached bone point, unperforated, but with a backward extension of the base to the stem near its far end, the lashing thread passing around the base extension and the stem. A cord is tied to the front end of the stem. When in use, the cord was tied to a line. It would have been easy enough to tie some strips of ti leaves to the far end of the stem with the hook lashing, as was done in the cowrie lures. (Buck 1964:357-358)

Samuel Kamakau described the *kilo* method of squid fishing as fishing with the eyes and stressed that only a skilled fisherman, knowledgeable in the ways of *he‘e* would be successful:

> *Kukui* nut [oil] was his magnifying glass. He would scull amongst hundreds of fishes, the flat blade of his paddle stirring the springs that welled up in the sea, until he reached a clear place where he could see bottom. There the fisherman chewed and spewed out the *kukui* nut meat. When he saw an octopus, he picked up his stone [lure]. This was a small crude stone-perhaps from an *imu*-attached to a wooden stem, *la‘au ‘amana,* with a *kakala* hook and bound together with cord, with a few blossoms tied to the *‘amana,* stem. This he lowered to perhaps a yard away from the octopus' burrow. When the *he‘e* saw the stone, its tentacles crept toward it, its body came out of the burrow and drew toward the stone until it was directly upon it. The fisherman pulled on the line, and the octopus was impaled on the *kakala* hook. The *‘okilo* fisherman kept moving along in his canoe and searching out *he‘e.* When the wind blew strongly this would put a stop to his searching, and he would return to shore. On a day when an *‘okilo* fisherman went out, he would fill his canoe with *he‘e.* (Kamakau 1976:69-70)

Interestingly, Kamakau described the use of an *imu* stone for use in the *kilo* lure. It is possible that the specimen found within T-141 was first used within an *imu*, or perhaps deliberately fired before being fashioned into a stone sinker.

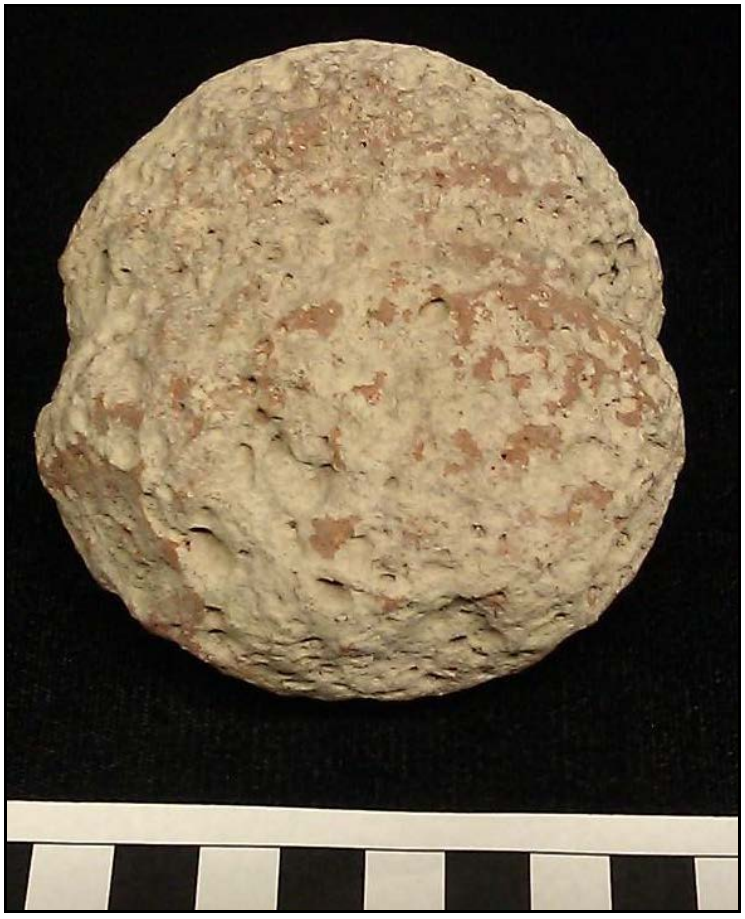


Figure 11. Grooved stone sinker found within T-141, Stratum III (Acc. # 141-H-1)

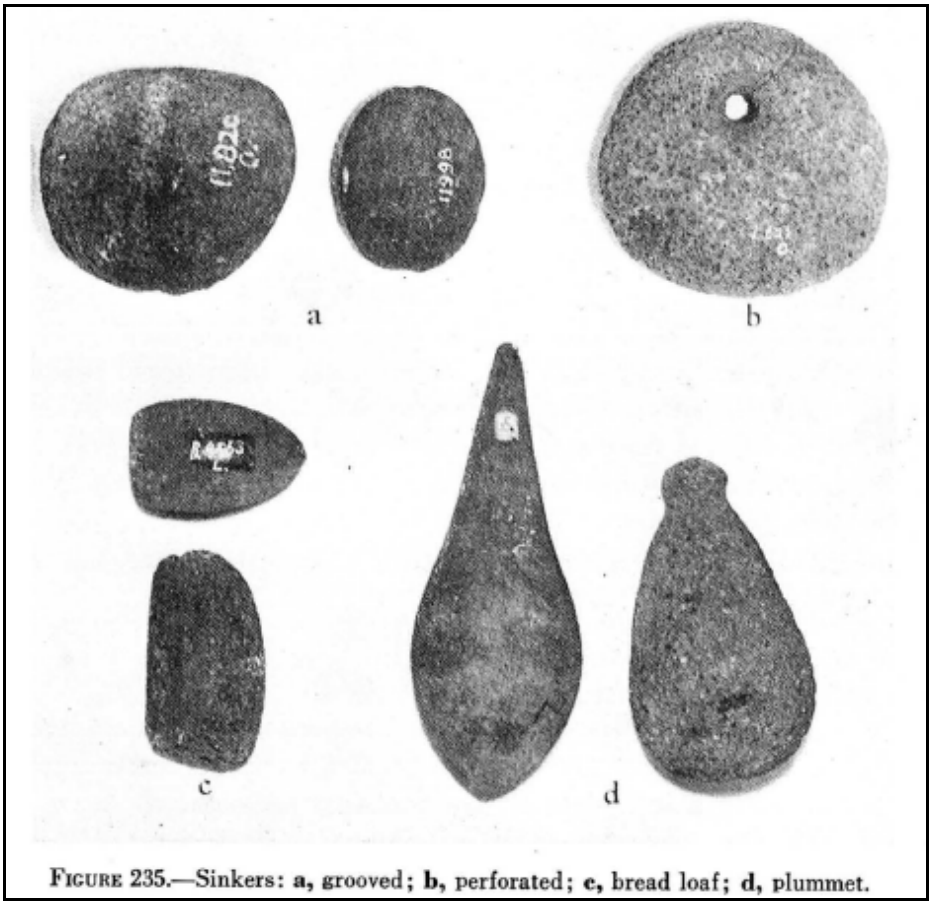


FIGURE 235.—Sinkers: **a,** grooved; **b,** perforated; **c,** bread loaf; **d,** plummet.

Figure 12. Different types of stone sinkers in the Bishop Museum collection (Buck 1964:343)

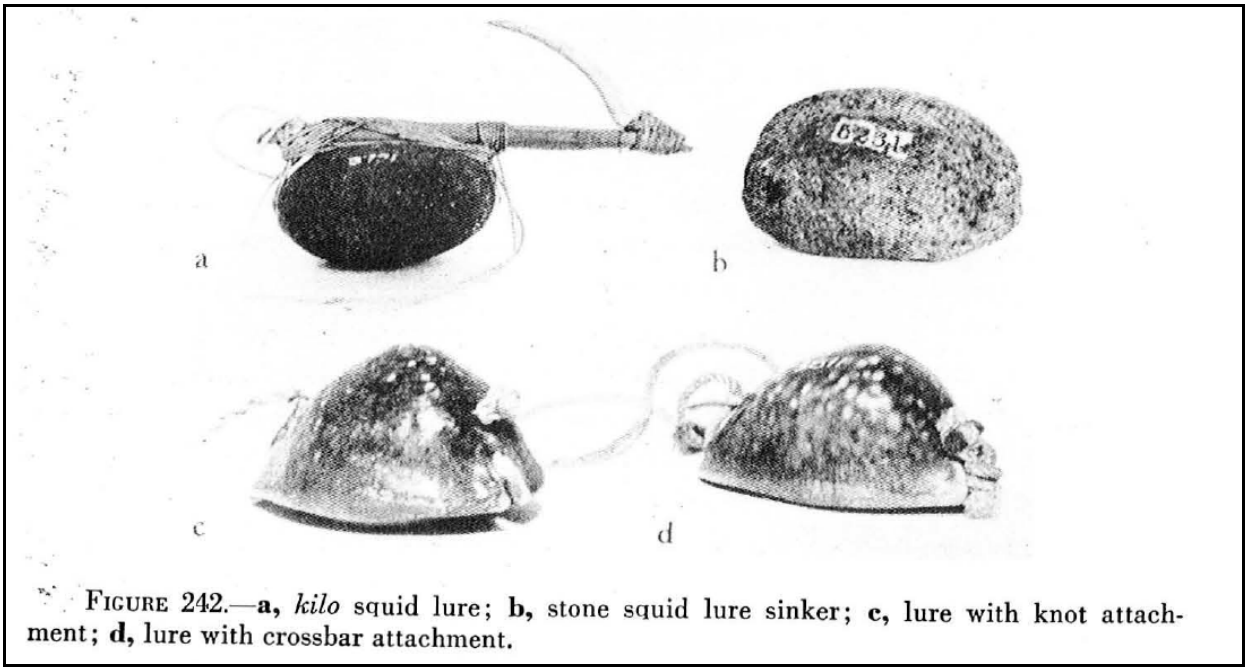
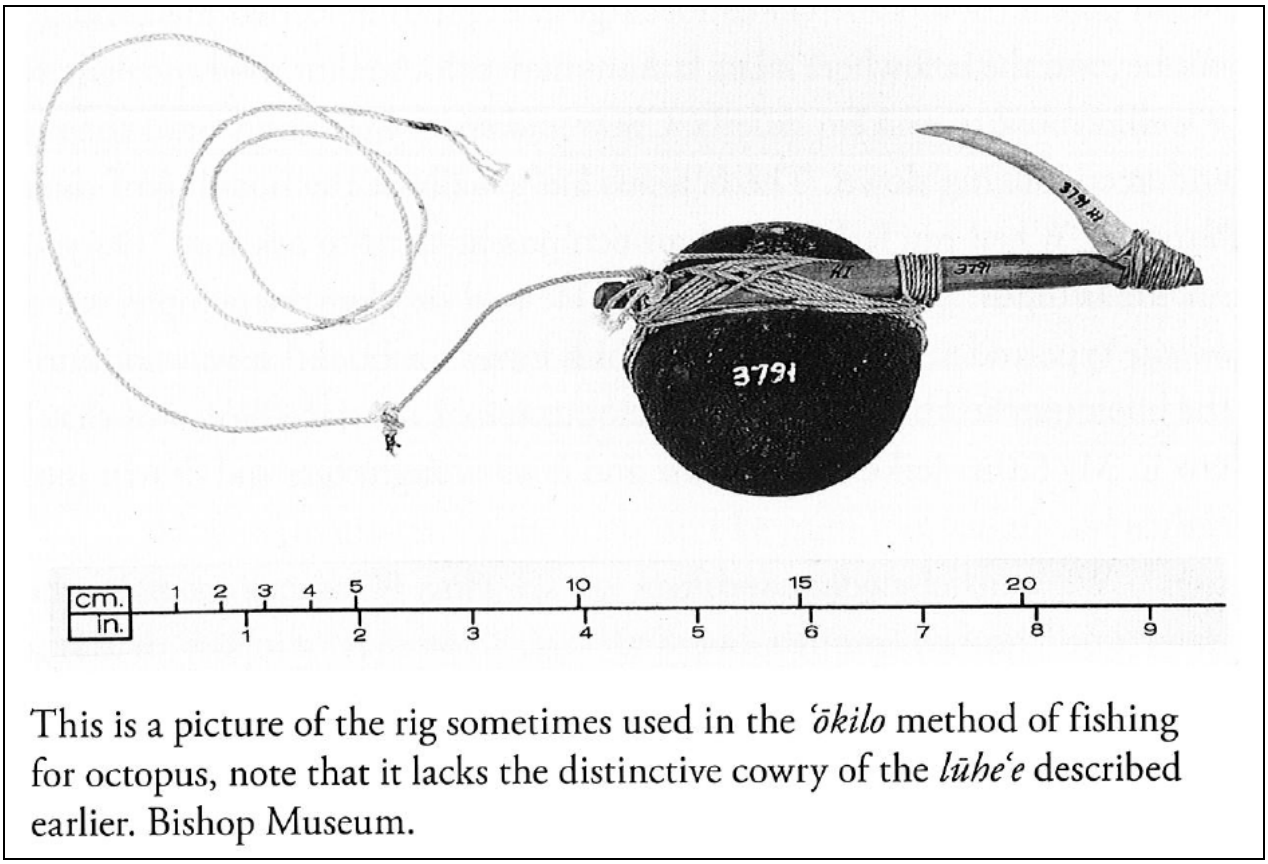


FIGURE 242.—**a,** *kilo* squid lure; **b,** stone squid lure sinker; **c,** lure with knot attachment; **d,** lure with crossbar attachment.

Figure 13. Types of squid and octopus lures (Buck 1964:358)



This is a picture of the rig sometimes used in the *ʻōkilo* method of fishing for octopus, note that it lacks the distinctive cowry of the *lūheʻe* described earlier. Bishop Museum.

Figure 14. An example of a *kilo* lure, found in the Bishop Museum collection (Kahaulelio 2006:76)

2.3.4 Basalt Game Stone

A vesicular basalt game stone was found within Feature 5 of Test Excavation 142 between 0.44-0.52 m below surface (Figure 15). The stone is circular along the axis and flat on either side. It does not evidence any polishing, but is rather rough and porous.

The flattened sides and roughness of the stone correspond with the characteristics of a traditional Hawaiian quoit stone (pitching disk) or a rough or child's version of an *ʻulu maika* game stone.

Hawaiian Pitching Games

The *ʻulu maika* game involved the throwing or rolling of a stone disk (*ʻulu maika*) down a prepared course (*kahua*) approximately thirty or forty yards (27-36 m) long, towards two sticks that were stuck in the ground only a few inches apart. The goal of the game was to throw or roll the stone disk between the sticks without striking either; or sometimes to see who could roll it the farthest (Ellis 1984:198; Buck 1964:372). Malo (1951:220) stated that bets were often placed on the outcome of these games.

The disks themselves were made of various kinds of stone (basalt, coral, breccia, sandstone, etc.), worked into a disc shape, being slightly convex on either side with a smooth wide circular edge (Figure 16). Ellis (1984:199) maintained that these were "finely polished, highly valued, and carefully preserved, being always oiled and wrapped up in native cloth, after having been used."

Brigham asserted that “children used rough and unpolished stones for their play” (1902:69) and indicated which stones in the Bishop Museum collection were used by children (1902:70). Emerson suggested in his notes in Malo’s Chapter 45, that:

> The half-grown bread-fruit, which is generally of a globular shape, was much used in playing this game, and undoubtedly gave its name, *ulu*, to both the thing itself and to the sport. Spherical stones, evidently fashioned for use in this game, are objects occasionally met with. The fact that the stone *ulu* is of spherical shape-in evident imitation of the fruit-as well as the fact that all the specimens met with have been fashioned out of a coarse, vesicular stone that is incapable of smooth finish or polish, while the material from which the *maika* is made is, in the majority of cases, a close, fine-grained basalt, leads to the conclusion that the *ulu* was the early form, and the *maika* the product of later evolution. (Emerson, in Malo 1951:221)

Games using the quoit, or pitching, stone were played on a mat and pitched a shorter distance, as observed by Buck in other parts of Polynesia, where the pieces were sometimes made of wood (Buck 1964:374). The quoit stones were generally lighter than the *‘ulu maika* stones.

The diameter, thickness and weight of the game stone within T-142 falls within the low end of the range of *‘ulu maika* stones in the Bishop Museum collection (listed by Brigham 1974:70) and the high end of the quoit stones in the Bishop Museum collection (listed by Buck 1964:373).

Figure 15. Vesicular basalt game stone found in T-142, Feature 5 (Acc. # 142-H-1)

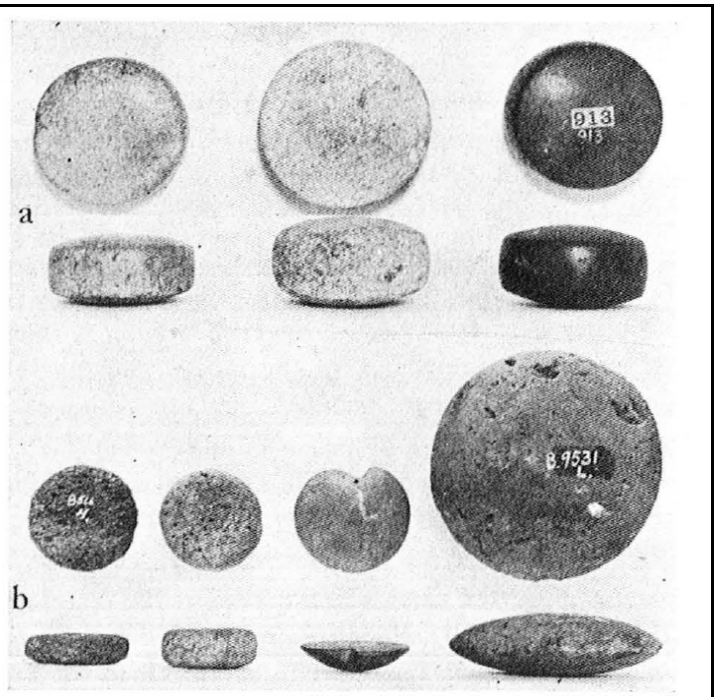


FIGURE 246.—**a,** *‘ulumaika;* **b,** quoits, or pitching disks.

Figure 16. Specimens of *‘ulu maika* and quoit stones (Buck 1964:372). Note the rounded, polished character of the *‘ulu maika* stones versus the flat, rough character of the quoit stones

2.3.5 Shell Fishhook

A shell fishhook was found within Feature 3, Stratum II of Test Excavation 142 between 0.56-0.64 m below surface (Figure 17). The fishhook has a straight to slightly incurved shank (with head missing), a V-shaped bend, is tipped in point, and is carved from an iridescent shell (*Isognomon* sp. or *Pinctada* sp.) shell (categorization adapted by Hammatt et al. 2000). It is a one-piece, rotating type fishhook, with the point curving in toward the shank.

Hawaiian Fishhooks

Hawaiian fishhooks had a wide range of sizes and shapes, adapted for catching various kinds of fish by different methods of fishing. The basic categories of fishhooks consisted of: one-piece or simple hooks (carved from a single piece of raw material), two-piece hooks (carved from two pieces of similar material and lashed together) and composite hooks (which were made from two or three different materials and lashed together) (Emory, Bonk and Sinoto 1959; Buck 1964; Kirch 1985; Maly and Maly 2003). One-piece fishhooks can be further divided into two major categories: jabbing (with parallel point and shank), and rotating (with the point curving in toward the shank (Figure 18) (Kirch 1985:200).

Much of the seriation dating that has been compiled for Hawaiian fishhooks, focuses on the head type or the combination of head type and other parts; since the fishhook found within T-142 is missing the head it is difficult to estimate a date. Even were the head present, there is a demonstrated regional variation in style, localized strategy and raw material procurement throughout the islands which has not been studied with a large enough sample size to overcome statistical variation. Kirch

notes that “the rate of change in fishhook styles was slow, so that relative dating using fishhooks can hardly be precise” (Kirch 1985:47).

While the precise dating of fishhooks can be problematic, style, size and material can be used to inform the fishing strategy being employed. The raw materials used for fishhooks include animal bone (commonly pig, bird and dog, but also human bone), pearl shell, turtle shell, wood, and even teeth (Buck 1964:324; Kirch 1985:204).

In some cases the type of material used is indicative of the type of fish or fishing strategy, and in other cases regional availability of materials seems to have influenced the strategy used. For example, a study by Hammatt (1979) of a fishhook manufacturing site on Moloka‘i recovered 114 fishhooks (different types, fragments, preforms and blanks) all of which were made of bone. Emory, Bonk and Sinoto (1959) suggest that the greater number of bone hooks found on Moloka‘i, Lana‘i, and Hawai‘i may be due to a lack of sufficient pearl shell on those islands. Their analysis of three sites on Hawai‘i Island revealed similar patterns:

> As the stratified distribution shows, there was a steady shift from pearl shell to bone at the three sites on Hawaii (H1, H2, and H8), suggesting the pearl shell was preferred but abandoned by necessity. The island of Oahu, on the other hand, had a relative abundance of pearl shell from Pearl Harbor. (Emory et al. 1959:31)

Kirch (1985) agreed with the implication that pearl shell was preferred, though not always available, and points out that archaeological sites on Kaua‘i and O‘ahu yield higher frequencies of pearl-shell hooks due to their developed reef ecosystems which were a major source for pearl shell (Kirch 1985:204). Pearl shell was not simply desired for personal or stylistic reasons, but rather for its effectiveness as a lure for particular kinds of fish. Pearl shell hooks are specifically mentioned by historical sources for both bonito (*aku*) fishing and *‘ōpelu* (mackerel scad) fishing.

Beckley 1883 describes the use of mother-of-pearl hooks for bonito fishing. First the bait-fish (small mullets and *‘i‘iao*) are brought to the fishing grounds and thrown live into the water where they then take shelter under the shadow of the boat and attract the bonito.

> The mother-of-pearl hooks are then thrown in the water without being baited and are mistaken for fish by the bonito, being on account of their shimmer and glisten like the iiao. The mother-of-pearl hooks are called pa, and are of two kinds, the pa-hau (snowy pa) and the pa-anuenue (rainbow pa). The pa-hau is used in the morning till the sun is high, as the sun’s rays striking it obliquely makes it glisten with a white pearly light which looks like the shimmer from the scales of the smaller kinds of fish on which the bonito lives, but at midday when the sun’s rays fall perpendicularly on it, it appears transparent and is not taken by the fish. The pa-anuenue is then used. This has the rainbow refractions, and the perpendicular rays of the sun make it shimmer and glisten like a living thing. (Beckley 1883:9)

While bonito (*aku*) fishing is the most commonly mentioned use (Beckley 1883:9; Jordan et al. 1903:737; Malo 1951:79), the hooks used for open ocean bonito fishing (*pa*) were much larger than the current specimen, approximately 5 inches (12.7 cm) long (Maly and Maly 2003:116). Smaller pearl-shell hooks, such as the specimen found in T-142, were variously termed *makau pāweo* and

hio-hio and are described as having been used for catching *‘ōpelu* (mackerel scad) (Buck 1964:325; Malo 1951:79).

Given the above information, including fishhook type, size and material, it is most likely that the fishhook from T-142 is a locally sourced *makau paweo* or *hio-hio* used for small scale, inshore, line fishing, such as for *‘ōpelu*.

Figure 17. Shell fishhook found within T-142, Feature 3, Stratum II (Acc. # 142-H-2)

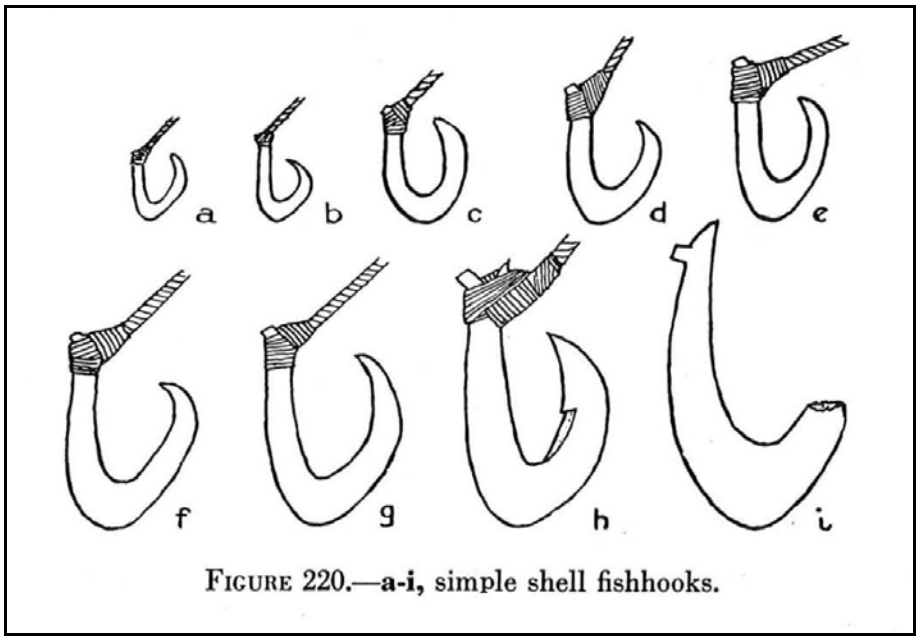


Figure 18. Types of one-piece fishhooks (Buck 1964:325)

2.3.6 Basalt Tool

A basalt stone tool fragment was found within Feature 1 (Stratum II) of Test Excavation 150 between 0.75-1.05 m below surface (Figure 19). The tool fragment consists of fine-grained black basalt with a polished facet showing fine striations running in two directions. Due to the absence of any original edges on the tool fragment, the specific type of basalt tool is unidentifiable.

Figure 19. Basalt tool fragment found in T-150, Feature 1 (Acc. # 150-H-2)

2.3.7 Worked Human Bone Tool

A worked human bone tool was found within Feature 1 (Stratum II) of Test Excavation 150 between 0.75-1.05 mbs. The artifact measures 8.0 cm long and is made from the posterior fragment of a proximal tibia (shinbone). The inferior portion of the bone fragment is beveled and polished. The artifact was found within Feature 1 which originated from a culturally-enriched A-horizon (SIHP # -5820). Feature 1 additionally contained marine shell midden, charcoal, fire-cracked rock, and a basalt tool fragment (see Section 1.1.3.6).

Human Bone Artifacts

The use of human bone, particularly human long bones, in the manufacture of tools and other cultural items in Hawai‘i has been documented at many archaeological sites and within museum skeletal collections. Artifacts in Hawai‘i fashioned from human bone include fishhooks, spittoons, weapons, and *kāhili*. The use of human bone could have both a positive and a negative connotation, though most often the latter.

Buck described the use of human long bones in the manufacture of fishhooks:

> Human long bones, particularly the thigh bone, were cut in lengths probably with sharp-edged pieces of stone flakes. The lengths were cut into rectangular pieces to correspond with the length and width of the proposed fishhook. The lower angles were rounded off to form the outer curve of the bend, and the edges were smoothed off with coral rasps…Hawaiians believed that fishhooks made from the bones of people without hair on their bodies, who were termed *‘olohe*, were more attractive to fish than hooks from normal bones. Thus the *‘olohe* individuals ran the risk of being pre-maturely dispatched to supply the luck-bringing material. (Buck 1964:324-325)

Kirch described the practice of utilizing the bones of defeated enemies for fishhooks as a means of humiliating the enemy:

> Materials used for fishhooks include animal bone (commonly pig and dog, and also human bone), pearl shell, bird bone, turtle shell, wood, and even teeth…The practice of making hooks from human bones was also used to humiliate enemies defeated in war, and chiefs went to considerable lengths to camouflage their burial places so that their bones would not fall into the hands of would-be fishhook-makers! The use of human bone for fishhooks seems to have greatly increased in the late prehistoric period, and was relatively uncommon earlier in Hawaiian prehistory. (Kirch 1985:204)

Human bone was also utilized in the manufacture of weaponry, as described by Buck:

> A specimen in Rome labeled by Giglioli has the handle formed of a human humerus cut off square above the lower expanded end for the attachment of a single tooth [shark]. The shaft is wrapped with human-hair braid and the head of the bone forms a convenient grip. The method of fixing the tooth is not clear. The implement is stated to have been obtained in Hawaii in 1886. Two implements with similar shafts are in the Blackmore Museum, Salisbury. The larger one, 16 inches long, figured by Edge-Partington (1890, I-53-2) has the humerus ornamented with rings of turtle shell; and as this form of ornamentation was frequently used with the handles of Hawaiian fly whisks (kahilis), the identification of the implement as Hawaiian seems to be beyond question. The second Salisbury specimen, 11 inches long, also described by Edge-Partington (1890, I-53-3), has a humerus shaft engraved with four narrow bands of crossed lines evenly spaced over the shaft. Thus the use of the human arm bone as a handle for a shark-tooth implement is proved by three specimens. (Buck 1964:447-448)

The use of human bone could also have a positive connotation as seen in the use of human leg bones in the manufacture of *kāhili*:

> The poles [of *kāhili*] were usually made out of a *kauila* wood spear, but more elaborate ones were made by stringing disks of tortoise shell, bone, or ivory on a slender core of *kauila* wood or whalebone. Leg bones were usually used to fashion these disks and it was considered an honor to have one's bones used on a kahili handle, in contrast to the insult when the bones were used as fishhooks or to inlay spittoons. The handle of one kahili in the museum collection (114) contains the right shin bone of Kaneoneo, as well as bones of Kaiana, Kalanikupule, and other lesser chiefs who were killed in the battle of Nuuanu in 1795 and were thus honored by Kamehameha. (Buck 1964:579)

The artifact found within Test Excavation 150 is a small tibia fragment, and as such was likely intended as a fishhook or other small implement.

2.4 Traditional Hawaiian Artifact Analysis for Kewalo Zone (Test Excavations 116 to 161)

One traditional Hawaiian artifact (excluding volcanic glass) was collected within the Kewalo zone of the City Center AIS study area, consisting of a dog-tooth ornament (see Table 1). The

ornament was documented within a buried A-horizon (Stratum II) within Test Excavation 167 (SIHP # -7429).

2.4.1 Dog-tooth Ornament

A dog tooth artifact consisting of a single, drilled canine tooth was found within the buried A-horizon (Stratum II) of Test Excavation 167 at 1.4 m below surface (Figure 20). The canine tooth is drilled at the root end. The drilled canine may have been part of a dog-tooth leg ornament (*kūpe‘e niho ‘īlio*) or part of a dog-tooth necklace (*lei ‘īlio*).

Kūpe‘e Niho ‘Īlio and Lei ‘Īlio

The dog-tooth leg ornament (*kūpe‘e niho ‘īlio*) was an ornament unique to Hawai‘i (Buck 1964:552-553). They were worn by male hula dancers, both for ornamentation and for their rattling sound, and were often described and drawn by early European travelers to Hawai‘i. James King, who travelled on Captain Cook’s third expedition to Hawai‘i, described the entertainment given by a man at Kealakekua Bay as well as the way he was dressed:

> […] round each leg, a piece of strong netting, about nine inches deep, on which a great number of dog's teeth were loosely fastened, in rows. (Cook 1784 vol. 3:27) (Figure 21)

Many examples of *kūpe‘e niho ‘īlio* can be found in various museums around the world (Figure 22). Peter Buck examined the 15 specimens (13 of them well preserved) held by the Bishop Museum:

> In the 13 dog-tooth ornaments which are complete the number of canine teeth used is 11,218, thus requiring 2,805 dogs to furnish the material. […] The teeth used were exclusively the canine teeth, each dog thus supplying four. The teeth are curved from front to back with the convexity forward and are compressed laterally. In a typical tooth, 40 mm. long, the greatest anteroposterior diameter is 10 mm. and the lateral diameter 6 mm. In length, the teeth range from about 28 mm. to 42 mm., but there may be a few shorter ones. In one ornament a few exceptionally large teeth range from 50 to 53 mm. in length. In most ornaments the teeth are matched to approximately the same length for each row, shorter teeth being used in the top row and longer teeth m the bottom. Thus in one ornament the teeth range in length from 32 to 35 mm. in the top row and from 37 to 40 mm. in the bottom row. In still another ornament, the top row ranges from 29 to 33 mm. and the bottom row, from 40 to 42 mm. In a few specimens, however, no such arrangement is seen. In seven of the 15 specimens, the color of the teeth has changed from the natural white to a dark color on the dentine part of the roots and to a bluish color on the enamel of the crowns. (Buck 1964:554-555)

Dog teeth were also utilized for pendant necklace ornamentation (*lei ‘īlio*). Kirch, in describing the Hawaiian aesthetic values as expressed in ornamentation, stated: “Among the common types [of ornaments] are dog teeth, drilled for suspension as pendants or used in dance anklets, and beads made form several kinds of shell. (Kirch 1985:195).

Buck (1964:557) also noted that the holes in the older specimens were fairly large and funnel-shaped from each side, indicating that a Hawaiian stone drill with a coarse point was used. In some

specimens the holes were much smaller and not funnel-shaped, indicating that a metal point was used in the drill.

As the drilled hole within the dog-tooth artifact found in T-167 contains parallel, rather than funnel-shaped, sides, it is likely that a metal tool was used for drilling rather than a traditional Hawaiian drill, thus indicating a post-Contact date.

Figure 20. Dog-tooth ornament found in T-167, Stratum II (Acc. # 167-H-1)

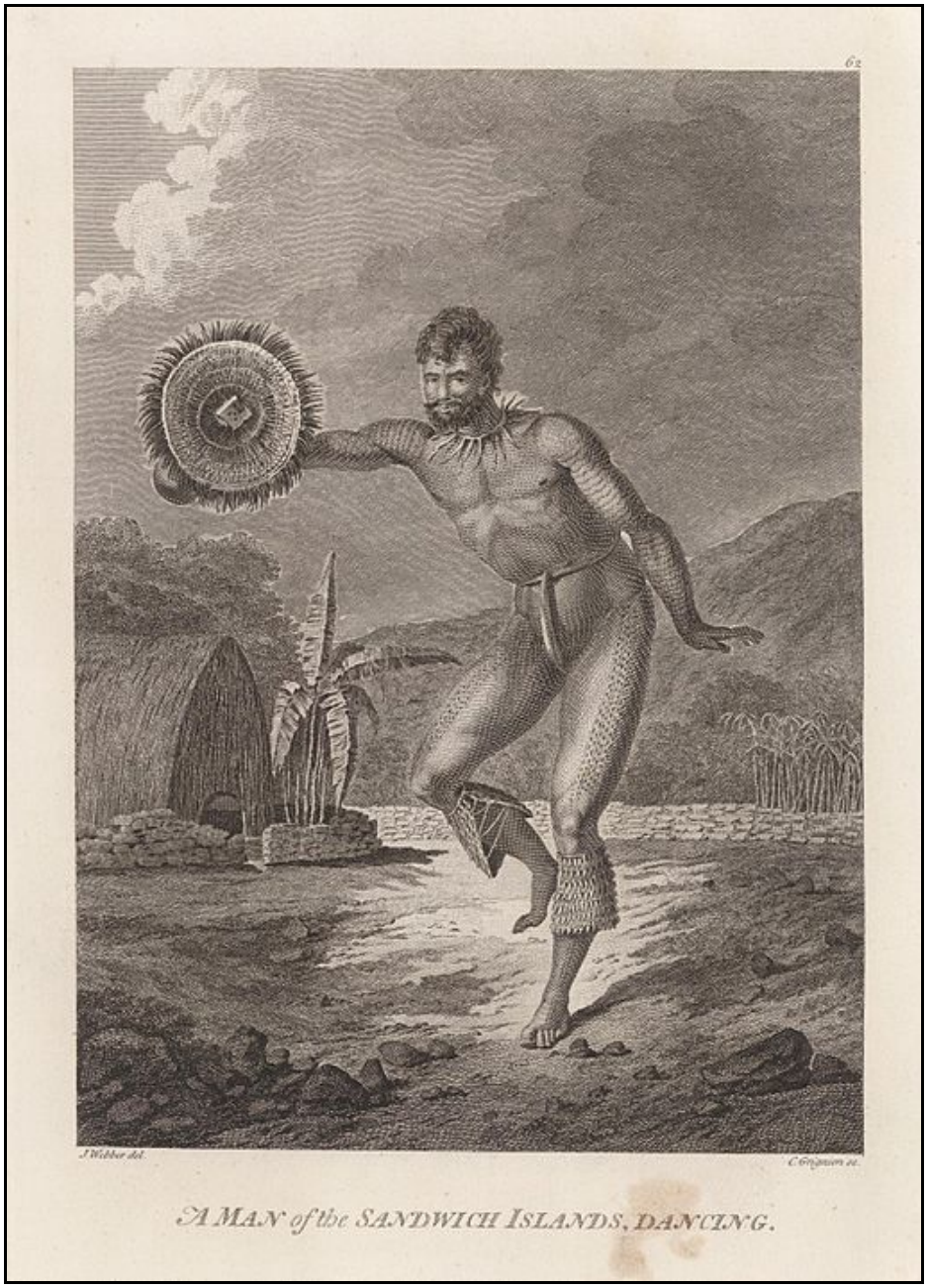


Figure 21. Drawing by John Webber during Captain Cook’s third voyage to the Hawaiian Islands, showing a male hula dancer adorned with dog-tooth leg ornaments (www.commons.wikimedia.org, accessed Mach 2013)

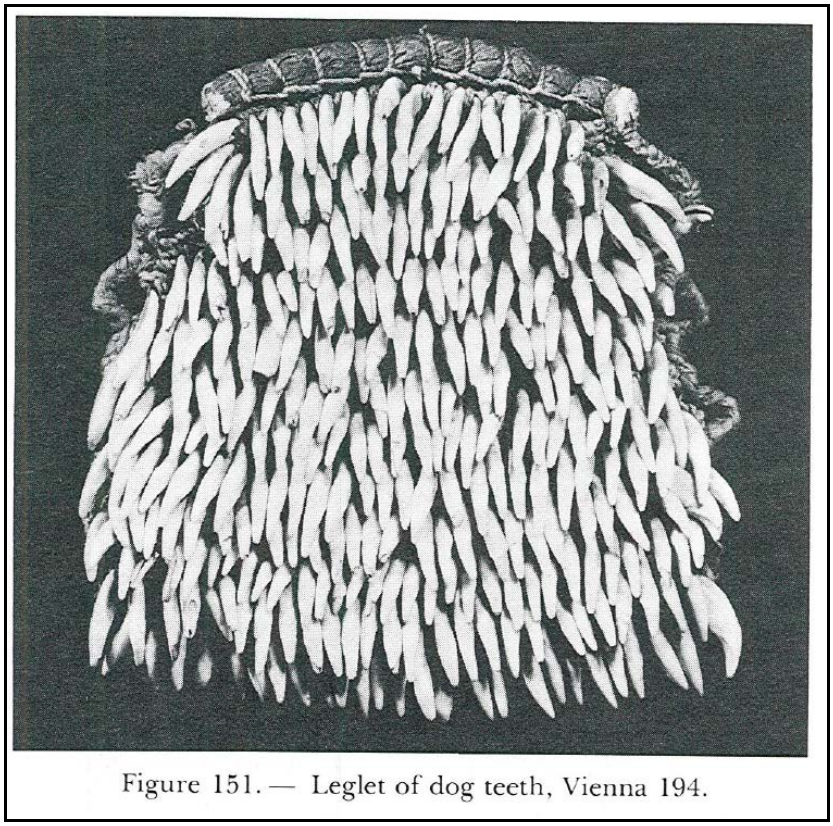


Figure 151. — Leglet of dog teeth, Vienna 194.

Figure 22. Leglet of dog tooth, collected during Captain Cook’s voyage (now housed in Vienna) (Kaeppler 1978:98)

2.5 Traditional Hawaiian Artifact Analysis for Kaka‘ako Makai Zone (Test Excavations 226 to 232A)

One traditional Hawaiian artifact (excluding volcanic glass) was collected within the Kaka‘ako Makai zone of the City Center AIS study area, consisting of a bone pick (see Table 1). The pick was documented at the upper boundary of a buried A-horizon (Stratum II) within Test Excavation 226A (SIHP # -2918).

2.5.1 Bone Pick

A bone pick manufactured from dog (*Canis lupus familiaris*) bone was found at the upper boundary of a loamy sand A-horizon (Stratum II) within Test Excavation 226A (Figure 23).

Bone picks

Bone picks are a very common artifact found within archaeological sites in Hawai‘i and were likely used for removing the meat from the shells of small marine invertebrates (Kirch 1985). At the Nu‘alolo Kai archaeological site on Kaua‘i, which contains one of the best preserved assemblages of traditional Hawaiian artifacts, thousands of bone picks have been catalogued. According to an informational blurb on the Bishop Museum blog (the artifacts are still in the process of being catalogued and a report is not currently available):

Thousands of these bone picks have been preserved. In general, they range from roughly 3-10 cm in length and are made of modified fish, dog, and bird bone. The bones have been modified to a sharp point on one end, resembling a rustic hypodermic needle. Each varies slightly from the next. Some are small and straight, while some are long and curved. Archaeologists have proposed these bone picks were used as all purpose tools. They could be used as a type of eating utensil, cutting tool, a needle, etc… (www.blog.bishopmuseum.org: Newsone)

Figure 23. Bone pick found in T-226A, at the interface of Strata Ic and II (Acc. # 226A-H-1)

2.5.2 Volcanic Glass

A total of 45 pieces of volcanic glass (72.6% of the entire assemblage of traditional Hawaiian artifacts) was recovered from 19 different test excavations (Table 2). The percentage of total traditional Hawaiin artifacts and the number of different locations of volcanic glass finds suggests the use of this artifact type was quite common in the City Center Section 4 corridor. Although a common artifact type, volcanic glass appears to have escaped notice, or at least mention, in early historical descriptions and early collections of Hawaiian artifacts.

In all cases, the volcanic glass was quite small (no specimens weighed more than 0.9 grams and the average weight was less than 0.2 g) and these were likely used for a relatively short period of time for a variety of cutting purposes. All specimens of volcanic glass were determined to be debitage, or as the direct result of primary flaking, with no evidence of re-touching to fashion a more formal tool. The focus of volcanic glass consideration was through EDXRF analysis which is the subject of the following section.

Table 2. Volcanic Glass Debitage

Zone	SIHP #	Trench	Stratum	Feature	Count	Total Weight (g)
West Kalihi	N/A	010	Ih	-	1	0.5
		014*	II	-	1	0.1
		019	II	-	1	<0.1
		020A*	II	-	1	0.4
Downtown Waterfront	-7427	096*	II	-	4	0.1
West Kaka‘ako	-7428	120*	II	3	1	0.3
		120*	II	4	1	1.5
		120*	II	5	1	<0.1
		120A*	II	-	1	0.1
		120A*	II	4	1	0.1
		120B*	II	-	1	0.1
	-02963	123	III	-	1	0.1
		124*	IIa	1	7	0.7
		124*	IIb	8	1	0.1
	-5820	146A*	IIa	2	2	0.2
		146A*	IIa	4	2	1.0
		150*	II	3	1	0.1
	N/A	151*	Id	2	2	0.4
		151	Id	-	1	0.9
	-5820	151*	IIa	-	1	0.1
	N/A	151A*	Id	1	1	0.1
Kewalo	N/A	177	IIa	-	1	0.1
Kaka‘ako East	-6636	189	III	-	1	0.1
Kaka‘ako Makai	-2918	226A*	IIa	3	1	0.1
		226B*	II	-	1	0.1
		226B*	II	2	1	0.1
		226B*	II	3	3	1.1
		226B*	II	5	1	0.1
		227A*	IIa	2	2	0.5
		227A*	IIa	4	1	0.2
TOTAL					**45**	**9.4**

*Volcanic glass submitted for EDXRF analysis